

## **LABOR REDUCTION TYPE AGRICULTURAL CHEMICAL SPRAYING SYSTEM HAVING AUTOMATIC HOSE WINDING AND UNWINDING APPARATUS**

### **BACKGROUND OF THE INVENTION**

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#### **1. Field of the Invention**

The present invention relates to a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus by which one worker is capable of spraying agricultural chemicals in such a manner that a hose is automatically wound and unwound from a reel based on a remotely controlled motor, and in particular to a labor reduction type agricultural chemical spraying system capable of enhancing a productivity in such a manner that a certain agricultural chemical is sprayed to farm products using a hose automatically unwound from a reel, and the hose is automatically unwound onto the reel based on a remotely controlled motor after work for thereby achieving a mechanical system and an automation in a farming work.

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#### **2. Description of the Background Art**

Generally, in the case that an agricultural chemical is sprayed with respect to the farm products in a vinyl house, a rice field, a fruit farm, etc., one end of a hose is connected to a motored sprayer equipped in an agricultural machine, and a worker holds a nozzle part fixed to the other end of the hose for thereby spraying farm products with a certain agricultural chemical.

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The hose has a length of over 100m. Therefore, an assistant is necessarily needed for manually winding or unwinding the hose after the work because the hose has a heavy weight. Therefore, two or three workers are needed for the work.

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Since two or three workers are needed for a spraying work of agricultural

chemicals, the cost of workers is increased wherein the workers lack in the farm areas, the workers are aged, and the women occupy major part in the workers. Therefore, the cost of the workers is increased, and the competitive power is decreased.

5           Since the winding work of hose having a certain weight and a slippery skin is repeatedly performed, the workability is decreased. A communication is bad between workers due to an engine noise, etc. Therefore, workability is decreased.

          As shown in Figure 1, a conventional automatic hose winding apparatus includes a reel 3 rotatably installed in a frame 1 wherein a hose 2 is wound on the  
10   reel 3, a driving motor 4 driven in accordance with a power supply for thereby rotating the reel 3, a clutch 7 installed between a coupling 5 engaged at a rotary shaft of the reel 3 and a driving coupling 7 engaged at a rotary shaft of the driving motor 4 for thereby intermitting a driving force applied to the reel 3, a remote control signal receiver 8 for controlling the driving motor 4 in accordance with a remote  
15   control signal, and a pair of guide rollers 9 installed in front of the reel 3 for enabling the hose 2 to be smoothly wound onto the reel 3.

          In the above conventional automatic hose winding apparatus, the reel 3 is rotated by a driving force of the driving motor 4 remotely controlled by a worker, and the hose 2 is wound onto the reel 3 for thereby reducing a worker's labor, so that it  
20   has advantages with respect to aged persons.

          However, when the hose 2 is wound onto the reel 3 based on the driving operation of the driving motor 4 after work, the hose 2 is not uniformly wound onto the left and right sides of the reel 3. Namely, the hose 2 may be eccentrically wound onto the reel 3 in the left or right side. At this time, it is needed to unwind the wound  
25   hose and to rewind onto the reel.

          In addition, in the case that the hose 2 wound onto the reel 3 is twisted and does not properly pass through the guide roller 9 installed in front of the reel 3, since

the hose 2 passes through the guide roller 9 by force, the guide roller 9 may be broken.

## SUMMARY OF THE INVENTION

5           Accordingly, it is an object of the present invention to provide a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus capable of significantly decreasing a worker's labor and a cost of workers in such a manner that a hose is automatically wound onto a reel in accordance with a remote control signal in a remote area, and only  
10           one worker is capable of spraying farm products with agricultural chemicals.

          It is another object of the present invention to provide a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus capable of achieving a desired work competitive power based on a reduced labor in such a manner that the length of a hose is automatically  
15           controlled by an assistant pulling apparatus at an intermediate position of a way of a farm field when an agricultural chemical is sprayed using a long hose, so that one worker can do an agricultural chemical spraying work.

          It is further another object of the present invention to provide a labor reduction type agricultural chemical spraying system having an automatic hose  
20           winding and unwinding apparatus capable of enhancing a workability in such a manner that a twisting of a hose wound onto a reel after work is prevented, and the hose is uniformly wound onto the left and right sides of the reel, and the hose is fast wound onto the reel.

          It is still further another object of the present invention to provide a labor  
25           reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus capable of achieving a universal use of hose in such a manner that a hose is tensely wound onto a reel even when a hose having a

different diameter is wound onto the reel in accordance with different kinds of farm products.

It is still further another object of the present invention to provide a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus capable of achieving a desired workability and convenience in such a manner that a hose winding unit is rotatable in a body having an engine, and the unwinding and winding directions of the hose is easily changed without rotating the body in a narrow place such as a farm field way, a water way, etc.

To achieve the above objects, there is provided a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus comprising a frame in which a motored sprayer connected with an engine is installed; a reel rotatably installed in the frame wherein a hose is wound onto the reel; a first driving motor driven in both directions for rotating the reel in normal and reverse directions in accordance with a remote control signal; a rotary shaft rotating by a driving force from the rotary shaft of the reel and reciprocating a movable piece engaged to an upper side in the left and right directions with respect to the reel; a second driving motor installed on the movable piece in cooperation with the first driving motor and driven in the normal and reverse directions in accordance with a remote control signal; and a pair of rollers that are installed in the movable piece and are rotatably connected with the second driving motor and tension an outer surface of the hose, and unwind the hose from the reel.

The roller includes a driving roller fixed to a shaft of a driven gear engaged with a driving gear connected with the second driving motor; and a driven roller that is rotatably installed in the movable piece opposite to the driving roller and closely contacts the hose to the driving roller for thereby moving the hose.

The driven roller is elastically installed to pull the driven roller in the direction

of the driving roller by an elastic member fixed to the movable member having one end fixed to the movable piece and the other end being slidable with respect to an engaging groove of the movable piece.

There are further provided a fixing rod provided at left and right sides of the movable member and protruded from an elongated hole formed at left and right sides of the movable piece; and a pair of guiders formed on an upper side of a supporting rod fixed to the fixing rod and having a ring adapted to support the hose passing between the driving roller and the driven roller.

There is further provided a twisting prevention guide member fixed to an outer guide among the guiders and having an outer lateral surface rounded in a radius direction for thereby preventing a twisting of the hose fed between the driving roller and the driven roller.

The hose assistant pulling apparatus installed between the reel and a nozzle body fixed to an end of the hose and adapted to pull the hose includes a driving motor that is installed in a housing and is driven in normal and reverse directions based on a driving power and cooperates with the first and second driving motors; a main reel fixed to the rotary shaft of the driving motor and winding the hose from the reel by at least more than one time thereonto; an assistant reel rotatably installed at the front end rear sides of the main reel and having a groove in an outer surface for accommodating the hose therein; and a tensioning reel that is rotatably installed at a portion opposite to the assistant reel and tensions the hose with respect to the assistant reel for thereby preventing a slip of the hose.

There is further provided a position adjusting plate that is integrally provided at a lower portion of the support rod having the tensioning reel fixed to its upper end and has an engaging groove locked by a lever fixed to the housing.

There is further provided a rotation unit including a fixing plate fixed to the frame; a rotation plate rotatably engaged to the fixing plate wherein the reel is

mounted on the rotation plate; and a stopper detachably engaged to a through hole respectively formed in the fixing plate and the rotation plate and adapted to prevent a rotation of the rotation plate with respect to the fixing plate.

The rotation unit includes a pair of cut-away grooves symmetrically formed at left and right sides of the rotation plate in an arc shape; and a guide pin protruded from the fixing plate and engaged to the cut-away groove for thereby rotating the rotation plate with respect to the fixing plate within a set angle range.

There are further provided a fixing groove formed on an outer surface of the rotation plate at a regular interval; a control pin fixed to the frame and being selectively and detachably engaged to the fixing groove; and an elastic member elastically biasing a construction that the control pin is engaged to the fixing groove as an initial state.

There is further provided a pair of guide rollers slidably engaged to a pair of guide rails integrally formed in the frame and supporting the hose wound onto the reel and preventing a twisting of the hose.

There are further provided a fixing shaft formed in the frame in a rear side of the reel; a tensioning bar having one end fixed to a rotation ring rotatably engaged to the fixing shaft and the other end that is rotated in a radius direction of the reel with respect to the fixing shaft as a center shaft; an elastic member fixed to the fixing shaft and elastically biases a construction that the tensioning bar is tensioned in the radius direction of the reel based on the winding amount of the hose as an initial state; and a movable piece integrally formed in the rotation ring and adapted to turn off the power of the first driving motor by tensioning a contact terminal of a limit switch fixed to the fixing shaft based on a rotation of the tensioning bar.

There are further provided a rotary shaft rotated by a driving force from the rotary shaft of the reel; a guider engaged to the rotary shaft and reciprocating in the left and right directions along a guide rail; a driving roller engaged to a spline shaft

rotatably connected with the rotary shaft and tensioning an outer surface of the hose; a movable member having an upper end engaged to the spline shaft and a lower end engaged to the guider for thereby moving the driving roller along the guider; and a driven roller rotatably fixed to the rotary shaft formed opposite to the spline shaft and being moved in the left and right directions.

There are further provided a pair of guide rails formed in the front sides of the spline shaft and the rotary shaft for thereby preventing a twisting of the hose.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become better understood with reference to the accompanying drawings which are given only by way of illustration and thus are not limitative of the present invention, wherein;

Figure 1 is a schematic view illustrating a conventional automatic hose winding and unwinding apparatus;

Figure 2 is a schematic perspective view illustrating a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention;

Figure 3 is an enlarged view illustrating a guider adapted to guide a hose in the left and right directions so that a reel is uniformly wound onto the left and right sides of the reel of Figure 2;

Figures 4A and 4B are views illustrating a process that a hose is wound onto the reel of Figure 2;

Figure 5 is a view illustrating a process that a roller supporting a hose is elastically fixed based on a variation of a diameter of a hose wound onto the reel of Figure 2;

Figure 6 is a view illustrating a state of use of the roller of Figure 5;

Figure 7 is a schematic view of a hose assistant pulling apparatus installed

between a reel and a nozzle part installed at an end of a hose for thereby pulling a hose according to the present invention;

Figure 8 is a schematic plane view illustrating the hose assistant pulling apparatus of Figure 7;

Figure 9 is a view illustrating a state of use of the hose assistant pulling apparatus of Figure 7;

Figure 10 is a schematic view illustrating a rotation apparatus of a hose winding unit in a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention;

Figure 11 is a view illustrating a rotation apparatus of the hose winding unit of Figure 10;

Figure 12 is a view illustrating a state of use of a rotation apparatus of the hose winding unit of Figure 11;

Figure 13 is a view illustrating another example of a hose winding unit in a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention;

Figure 14 is a view illustrating a state of use of the hose winding unit of Figure 13;

Figure 15 is a view illustrating another example of a rotation apparatus of a hose winding unit in a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention;

Figure 16 is a schematic view illustrating a hose detection unit capable of detecting whether a hose is fully unwound from a reel in a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention;



Figure 17 is a view illustrating a state of use of the hose detection unit of Figure 16; and

Figure 18 is a view illustrating another example of a hose winding unit in a labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in Figures 2 through 6, the labor reduction type agricultural chemical system having an automatic hose winding and unwinding apparatus according to the present invention includes a frame 10 having a motored sprayer 34 connected with an engine E, a reel 12 rotatably installed in the frame 10 wherein a hose 11 is wound thereonto, a first driving motor 13 capable of rotating the reel 12 in the normal or reverse direction based on a remote control signal from a worker, a rotary shaft 15 rotated by a driving force from a reel rotary shaft (not shown) through a chain and having a spiral rewinding groove 15a so that a movable piece 14 engaged to an upper side during a rotation reciprocates in the left and right directions with respect to the reel 12, a second driving motor 16 installed at the movable piece 14 in cooperation with the first driving motor 13 and is driven in the normal or reverse direction based on a remote control signal from a worker, and a pair of rollers installed at the movable piece 14 and supporting an outer surface of the hose 11 and unwinding the hose from the reel 12 when the rollers are rotated by the second driving motor 16.

The rollers are formed of a driving roller 17 rotatably installed at a shaft 21 of a driven gear 20 engaged with a driving gear 19 connected with the second driving motor 16, and a driven roller 18 rotatably installed at the movable piece 14 opposite to the driving roller 17 and adapted to move the hose 11 by closely contacting the hose 11 to the driving roller 17.

The driven roller 18 is elastically supported in such a manner that the driven roller 18 is pulled in the direction of the driving roller 17 by at least one elastic member 24 fixed to a movable member 23 of which one end is fixed to the movable piece 14, and the other end is slidable with respect to the engaging groove 22 of the movable piece 14.

A fixing rod 26 is provided at left and right sides of the movable member 23 and is protruded to the outside of an elongated hole 25 formed opposite to the left and right sides of the movable piece 14. A pair of guiders 30 and 31 are provided in the upper side of the fixing rod 27 fixed to the fixing rod 26 and are formed of rings 28 and 29 supporting the hose 11 passing through between the driving roller 17 and the driven roller 18.

There is further provided a twisting prevention guide member 32 fixed to the outer guider 31 among the guiders 30 and 31 and having an outer surface rounded in the radius direction for preventing a twisting of the hose 11 provided between the driving roller 17 and the driven roller 18.

As shown in Figures 7 through 9, the hose assistant pulling apparatus installed between the reel 12 and the nozzle part 120 fixed to an end of the hose 11 and adapted to pull the hose 11 includes a driving motor (not shown) installed in a housing 100 and cooperating with first and second driving motors 13 and 16, so that the driving motor is driven in the normal or reverse direction based on a power supply, a main reel 103 fixed to a rotary shaft of the driving motor and winding the hose 11 unwound from the reel 12 at least more than one time, an assistant reel 105 rotatably installed in the front or rear sides of the main reel 103 and having a groove 104 in an outer surface for accommodating the hose 11, and a tensioning reel 106 rotatably installed at a portion opposite to the assistant reel 105 and tensioning and supporting the hose 11 to the assistant reel 105 and preventing a slip of the hose 11.

There is further provided a position adjusting plate 111 integrally installed in

a lower portion of the support rod 107 having an upper end fixed to the tensioning reel 106 and having an engaging groove 109 locked by a lever 108 fixed to the housing 100.

As shown in Figures 10 through 12, there is further provided a rotation unit. In the rotation unit, a fixing plate 201 is fixed to the frame 10. A rotation plate 202 is rotatably engaged to the fixing plate 201 wherein the reel 12 is mounted on the rotation plate 202. A stopper 208 is engaged with a through hole formed in the fixing plate 201 and the rotation plate 202 and prevents a rotation of the rotation plate 202 with respect to the fixing plate 201.

The rotation unit includes a pair of cut-away grooves 204 and 205 symmetrically formed in the left and right sides of the rotation plate 202 in an arc shape, and guide pins 206 and 207 protruded from the fixing plate 201 and engaged to the cut-away grooves 204 and 205 wherein the guide pins 206 and 207 guide an operation that the rotation plate 202 is rotated within a certain range of angle with respect to the fixing plate 201.

A fixing groove 209 is formed on an outer surface of the rotation plate 202 at a regular interval. A control pin 210 is fixed to the frame 10 and is selectively detachable with respect to the fixing groove 209. An elastic member 211 elastically biases a state that the control pin 210 is engaged to the fixing groove 209.

As shown in Figures 13 and 14, a pair of the guide rollers 251 are slidably engaged to a pair of guide rails 250 integrally formed in the frame 10 and are adapted to support the hose 11 wound onto the reel 12 and to prevent a twisting of the hose 11.

In the drawings, reference numeral 33 represents a caster engaged on the floor of the frame 10, 35 represents a handle, 36 represents an antenna for receiving a remote control signal, H represents a hose for supplying an agricultural chemical to the motored sprayer 34, and 38 represents a control box for controlling

the driving motor, etc. based on a previously inputted data value in accordance with a remote control signal.

The operations of the labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention will be described with reference to the accompanying drawings.

As shown in Figures 2, 4, 5 and 9, in the case that agricultural chemicals are sprayed with respect to farm products growing in a vinyl house (generally having a length of 50~100m) using a motored sprayer, one worker in a remote area automatically unwinds the hose 11 wound onto the reel 12 or automatically winds the hose 11, while holding the nozzle part 120 installed at an end of the hose 11.

When the remote controller RV suspended on the worker's neck or engaged to the nozzle part 120 is operated, a remote control signal is applied to the antenna 36 for receiving a remote control signal, and the first driving motor 13 is driven in the reverse direction based on the control box 38. The reel 12 is rotated at a certain speed in the counterclockwise direction, so that the hose 11 is unwound from the reel 12.

At the same time, as the second driving motor 16 is driven in the reverse direction in accordance with a remote control signal from the worker, the driving roller 16 is rotated in the counterclockwise direction based on the rotations of the driving gear 19 fixed to the rotary shaft of the second driving motor 16 and the driven gear 20 engaged with the driving gear 19.

The hose 11 is unwound from the reel 12 in force based on a rotational force of the driven roller 18 and the driving roller 17 wherein the driven roller 18 is elastically supported and is pulled in the direction of the driving roller 17 by an elastic force of the elastic member 24.

Therefore, the worker holds the nozzle part 120 fixed to an end of the hose 11 and sprays an agricultural chemical at a certain pressure by the motored sprayer

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The pressure of the agricultural chemical inputted through the hose H is increased to a high pressure using the motored sprayer 34 connected with the engine E, and then the agricultural chemical is sprayed with respect to the farm products in vaporized states in a high pressure for thereby achieving a desired agricultural chemical spraying operation. Since the above described operation is well known in the art, the detailed descriptions thereon will be omitted.

As shown in Figures 7 through 9, the pulling force of the hose 11 that the worker may feel heavier due to the weight of the hose 11 may be minimized because the hose assistant pulling apparatus installed at an intermediate position between the reel 12 and the nozzle part 120 installed at an end of the hose 11 pulls the hose 11 in the direction of the worker in force.

Therefore, it is possible to pull the hose 11 wound onto the main reel 103 by at least more than one time engaged to the rotary shaft 102 of the driving motor by a driving operation of the driving motor (not shown) installed in the housing 100 wherein the driving motor is operated in cooperation with the first and second driving motors 13 and 16.

The hoses 11 can pass through the main reel 103 with a certain tension force based on the assistant reel 105 and the tensioning reel 106 rotatably installed at the front and rear sides of the main reel 103.

Therefore, the worker holds the nozzle part 120 fixed to an end of the hose 11 sequentially passing through the assistant reel 105, the tensioning reel 106, the main reel 103, the assistant reel 105 and the tensioning reel 106 and sprays the farm products with an agricultural chemical at a certain pressure by the motored sprayer 34 in a vaporized state.

As shown in Figure 8, in the case that the diameter of the hose 11 wound onto the reel 12 is changed based on the farm products, when it is needed to

change the hose 11, the position of the tensioning reel 106 is changed for thereby achieving a universal use.

In the case that the hose 11 is changed to a small diameter hose, the locked state of the lever 108 adapted to fix the position adjusting plate 111 to the housing 100 is unlocked, and the hose 2 is disengaged from the main reel 103 and the assistant reel 105. The changed hose 11 is wound onto the main reel 103 by at least more than one time and is mounted into the groove 104 of the assistant reel 105. The support rod 107 integrally formed on the position adjusting plate 111 is pushed in the direction of the assistant reel 105. The hose 11 is closely contacted with the assistant reel 105 by the tensioning reel 106.

The lever 108 is moved and locked to the engaging groove 109 formed in the inner surface of the elongated hole 110 formed in the position adjusting plate 111. When the diameter of the hose is changed using the tensioning reel 106 being movable with respect to the assistant reel 105, the hose 11 is tensioned and automatically pulled in the direction of the worker.

In the case that hose 11 is wound onto the reel 12 after a certain agricultural chemical spraying operation, the second driving motor 16 is driven in the normal direction by a remote control signal applied from the worker to the remote control signal receiving antenna 36. The hose 11 is pulled in the direction of the reel 12 by the driving roller 17 rotated in the clockwise direction and the driven roller 18 rotated in the counterclockwise direction.

At the same time, the first driving motor 13 is driven in the normal direction by a remote control signal applied from the worker to the remote control signal receiving antenna 36, and the reel 12 is rotated in the clockwise direction. Therefore, the hose 11 is wound onto the hose 11.

As shown in Figure 2, it is possible to prevent the hose 11 wound onto the reel 12 from being twisted using the twisting prevention guide member 32 integrally

fixed to the movable plate 14.

In the case that the hose 11 wound onto the reel 12 is twisted, the reel is guided by the grooves formed on the surfaces of the twisting prevention guide member 32 for thereby preventing the twisting of the hose 11.

5 As shown in Figures 5 and 6, in the case that the hose 11 is changed by changing the diameter of the hose 11 wound onto the reel 12, the position of the driven roller 18 is changed in the direction of the driving roller 17 by the elastic member 24 for thereby achieving a universal use.

10 In the case that the hose 11 is changed to a small diameter hose, the movable member 23 fixed with the driven roller 18 is slightly slid in the right direction in Figure 5 along the engaging groove 22 slidably formed in the movable piece 14 by an elastic force of the elastic member 24. Even when the diameter of the hose is decreased and changed by the opposite driving roller 17 and driven roller 18, the hose 11 is tensely supported and wound onto the reel 12.

15 As shown in Figures 3 and 4A and 4B, the movable piece 14 fixed with the driving roller 17 and the driven roller 18 reciprocates in the left and right directions along the rewinding groove 15a formed on an outer circumferential surface of the rotary shaft 15 rotated by a rotational force transferred to the rotary shaft of the reel 12 through a chain. The hose 11 passing between the driving roller 17 and the  
20 driven roller 18 is uniformly wound onto the reel 12.

As shown in Figures 10 through 12, in the case that the direction of an agricultural chemical spraying work is changed based on an arranged direction of the farm product, the direction of the reel 12 is changed without changing the first position of the frame 10 transferred to a culturing chamber, etc. for thereby  
25 achieving a continuous agricultural chemical spraying work.

The stopper 208 is disengaged from the through holes (not shown) of the fixing plate 201 and the rotation plate 202, and the rotation plate 202 is held and

rotated in the counterclockwise direction (Figure 12) with respect to the center of the fixing pin 203 formed at the center of the fixing plate 201. Therefore, it is possible to change the unwinding direction of the hose 11 from the reel 12 engaged to the rotation plate 202 wherein the direction of the reel 12 is changed.

5           The rotation plate 202 is protruded from the fixing plate 201 and is guided by the guide pins 206 and 207 engaged to the cut-away grooves 204 and 205 formed in the rotation plate 202 and is rotated within a range of the cut-away grooves 204 and 205.

10           In addition, during the agricultural chemical spraying work, the rotation of the rotation plate 202 is prevented by the control pin 210 of the fixing plate 201 selectively engaged to the fixing groove 209 formed on an outer surface of the rotation plate 202 at a certain distance.

15           As shown in Figures 13 and 14, as the movable piece 252 fixed with the driving roller 17 and the driven roller 18 reciprocates in the left and right directions with respect to the reel 12 along the spiral groove formed in the outer circumferential surface of the rotary shaft 15 rotated by a rotational force transferred from the rotary shaft of the reel 12 through a chain, the hose 11 passing between the driving roller 17 and the driven roller 18 fixed to the movable piece 252 with a certain tension force is uniformly wound onto the left and right sides of the reel 12.

20           Since the hose 11 wound onto the reel 12 passes through a pair of the guide rollers 251 moved along the guide rail 250 integrally fixed to the frame 10 and then passes through the driving roller 17 and the driven roller 18, it is possible to prevent a twisting of the hose 11.

25           As shown in Figure 15, in the reel rotation apparatus for an agriculture chemical spraying work according to the present invention, the fixing plate 201 is integrally fixed to the frame 10, and the rotation plate 202 is rotatable in the left or right direction at 360° with respect to the fixing pin 203 protruded from the center of



the fixing plate 201 as a center shaft. Therefore, the rotation plate 202 is rotatable in the left or right direction with respect to the fixing plate 201.

Since the prevention of the rotation plate 202 by the engaging pin 210 elastically supported by the frame 10 for an engagement to the fixing groove 209 formed on an outer surface of the rotation plate 202 is the same as the construction of Figure 11, the detailed description thereof will be omitted.

As shown in Figures 16 and 17, the labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention includes a fixing shaft 302 provided in the frame 10 in a rear side of the reel 12, a tensioning bar 300 having one end fixed to the rotation ring 301 rotatably engaged to the fixing shaft 302 and the other end rotating in the radius direction of the reel 12 with respect to the fixing shaft 302 as a center shaft, an elastic member 303 fixed to the fixing shaft 302 and elastically biasing the tensioning bar 300 based on the winding amount of the hose 11 in a radius direction, and a movable piece 304 integrally formed in the rotation ring 301 and tensioning a contact terminal 305 of a limit switch 306 fixed to the fixing shaft 302 based on a rotation of the tensioning bar 300 for thereby turning on and off the power of the first driving motor 13.

As shown in Figure 17, when the hose 11 is fully unwound from the reel 12, since the tensioning bar 300 is rotated in the clockwise direction with respect to the fixing shaft 302 as a center shaft, the contact terminal 305 integrally formed in the fixing shaft 302 is touched based on the rotation of the movable piece 304 integrally formed in the rotation ring 301 for thereby turning off the limit switch 306, so that the power supplied to the first driving motor 13 is disconnected.

When the hose 11 is fully unwound from the reel 12, as the driving of the first driving motor 13 adapted to rotate the reel 12 is stopped, it is possible to stop the rotation of the reel 12.

As shown in Figure 18, the labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention includes a rotary shaft 401 rotated by a driving force transferred from the rotary shaft of the reel 12 through a chain 400, a guider 412 engaged to the rotary shaft 401 and reciprocating in the left and right directions along a guide rail 409, a driving roller 408 engaged to a spline shaft 405 connected to the rotary shaft 401 through a chain 403 and tensioning an outer surface of the hose 11, a movable member 411 having an upper end engaged to the spline shaft 405 and a lower end engaged to the guider 412 for thereby moving the driving roller 408 based on the guider 412, a driven roller 407 rotatably fixed to the rotary shaft 406 formed opposite to the spline shaft 405 and being moved in the left and right directions, and a pair of guide rails 410 formed in the front sides of the spline shaft 405 and the rotary shaft 406 for thereby preventing a twisting of the hose 11.

As the rotary shaft of the reel 12 is rotated, the rotation force transferred through the chain 400 rotates the rotary shaft 401 through a sprocket 402, and the rotation force transferred from the rotary shaft 401 through the chain 403 rotates a spline shaft 405 through the sprocket 404.

When the rotary shaft 401 is rotated, since the guider 412 is moved in the left and right directions along the guide rail 409, the hose 11 is tensioned by the driving roller 408 engaged to the spline shaft 405 passing through the movable member 411 engaged to the guider 412 and the driven roller 407 fixed to the rotary shaft 406.

Therefore, the guider 412 and the movable member 411 are movable in the left and right directions wherein the guider 412 and the movable member 411 are adapted to maintain a certain tension force of the hose 11 wound onto the reel 12 when the hose 11 is wound onto the reel 12 using a driving force of the first driving motor 13 and to guide the hose 11 to be uniformly wound onto the left and right

sides of the reel 12.

In the case that the hose 11 is wound onto the reel 12, it is possible to prevent a twisting of the hose 11 by a pair of guide rails 410 provided opposite to the spline shaft 405 and the rotary shaft 406.

5 As described above, in the labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention, in the case that a worker sprays a certain agricultural chemical with respect to a farm product growing in a vinyl house, etc., the hose 11 is automatically pulled by an assistant pulling apparatus at an  
10 intermediate position of the ways formed in the farm field wherein the hose 11 is wet and has wet soils on its outer surface and then is automatically wound onto the reel 12 in accordance with a remote control signal by a worker. Therefore, in the present invention, additional worker is not needed, and an automatic farming system is achieved. The number of workers is decreased, and a worker-related cost is  
15 decreased. The labor is decreased, so that it is possible to achieve a desired competitive power.

The labor reduction type agricultural chemical spraying system having an automatic hose winding and unwinding apparatus according to the present invention will be described.

20 In the present invention, the hose is automatically wound onto the reel by in accordance with a remote control signal even at a remote area. One worker is capable of spraying a farm product with a certain agricultural chemical. The number of workers is decreased, and a worker-related cost is decreased.

25 In addition, during the agricultural chemical spraying work using a long hose, the hose is automatically pulled by an assistant pulling apparatus at an intermediate position in the way of the farm field, so that the labor is reduced for thereby achieving a competitive power.

In the present invention, it is possible to prevent a twisting of the hose when it is wound onto the reel after the agricultural chemical is sprayed. The hose is uniformly wound onto the left and right sides of the reel, so that the hose is fast wound onto the reel.

5 Even when the current hose is changed with a hose having a different diameter based on the kinds of farm product, the hose is wound onto the reel with a certain tension for thereby achieving a universal use of the system.

In addition, it is possible to easily change the unwinding direction of the hose based on a reel direction change without moving the body having a hose winding unit at a place having a narrow width like in a farm field way or a farming  
10 water way.

As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described examples are not limited by any of the details  
15 of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the meets and bounds of the claims, or equivalences of such meets and bounds are therefore intended to be embraced by the appended claims.